Workshop on USACE Civil Works Hydraulic Infrastructure

13 –15 March 2001

Geotechnical Engineering Research Program

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Problems:

- All Corps projects founded on something – soil and rock
- Uncertainty – unknown conditions in foundations
- Population growth, expansion of cities
- Upstream-downstream conflicts

Problems:

- Advances in predicting PMF, earthquake ground motions
- Push for faster, better, cheaper and resulting channel modifications
- Time-related phenomena and river/channel modifications change levee conditions
- Uncertainty in subsurface + urban encroachment + higher loads + dam management conflicts = unknown performance

Thrust areas:

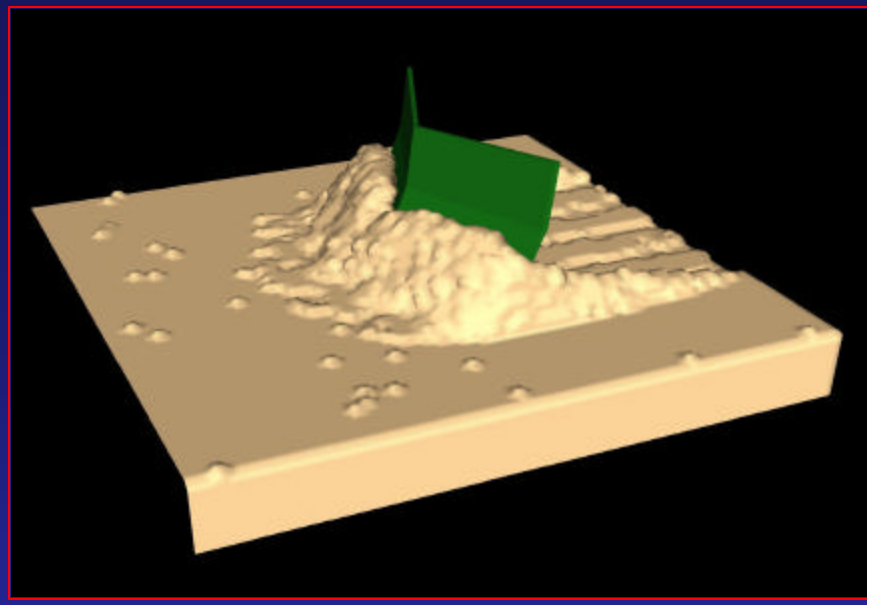
- Reduce uncertainty in subsurface
- Analytical tools for complex 3-D problems
- Performance of spillways and levees under stress
- Technical basis for permitting modifications

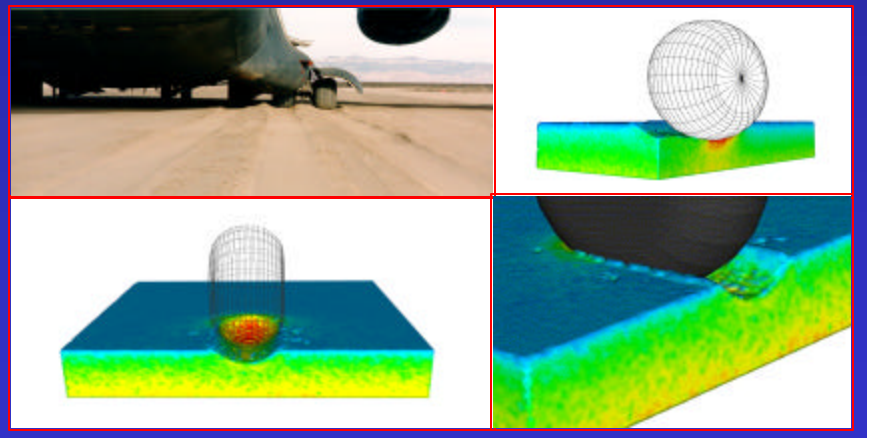
Current Research:

- Reduce uncertainty
  - Unique issue of dams on clay shales
  - Piping mechanics
    - Historical problem areas
    - Mechanism for predictive tools

Current Research:

- Analytical tools
  - Not just repackaging with windows-based software
  - Leveraging from/with military development of particle motion
  - Transition to PC-based tool (project cancelled)
  - Partnering with USDA to modify spillway analysis tool to Corps applications





Current Research:

- Spillways and levees under stress
  - Technical basis for guidance on location/characteristics of emergency spillways
  - Predictive tool to relate geologic characteristics to performance
  - Analytical tool to predict performance of existing spillways under new PMF
  - District partners on piping triggers

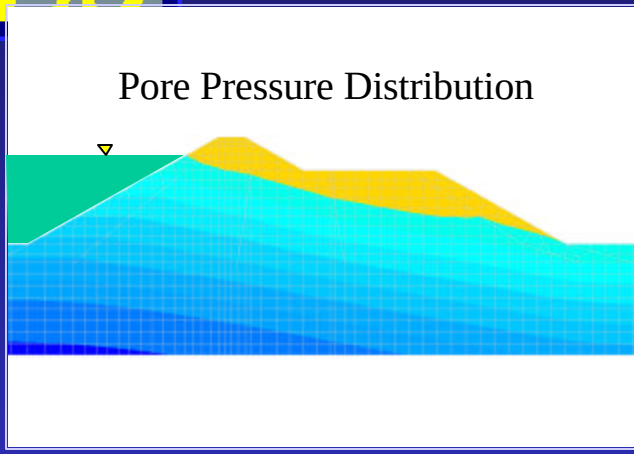
Current Research:

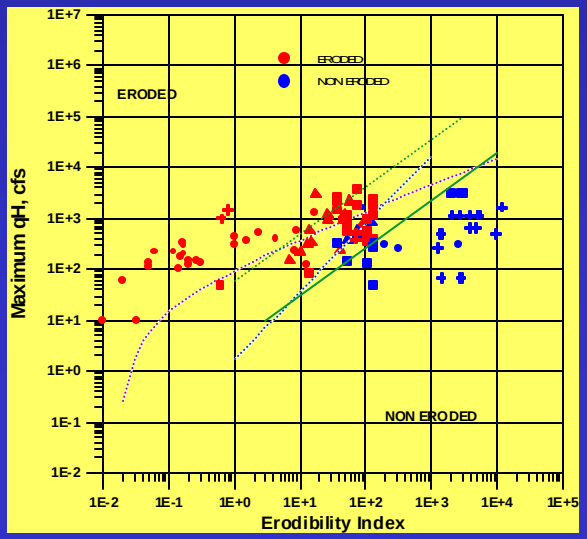
- Technical basis for permitting
  - Want new utilities with minimal urban or environmental impact
  - Basis for permitting utilities under levees

Products:

- PC-STUBBS
  - Introduced through workshop (currently unfunded)
  - Available on web

- Tool for predicting threshold of spillway erosion
  - USSD (USCOLD) bulletin
  - Web distribution
  - New section for Hydraulic Design of Spillways EM 1110-2-1603

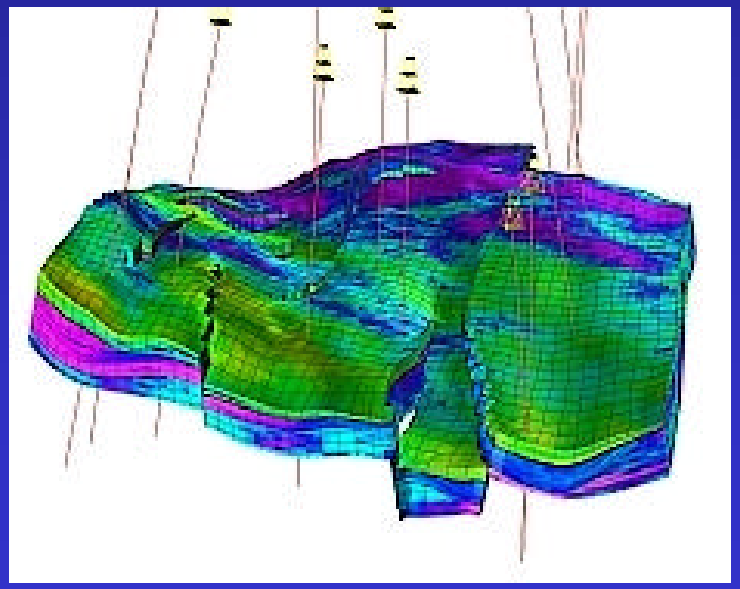




Products:

- Spillway erosion analysis
  - Corps-SITES from partnership with USDA
  - Albuquerque experience

- 3-D conceptual model of complex subsurface under Oahe dam
  - Work individually with Districts
  - Multi-program tools coordinated with uplift uncertainty in Risk program

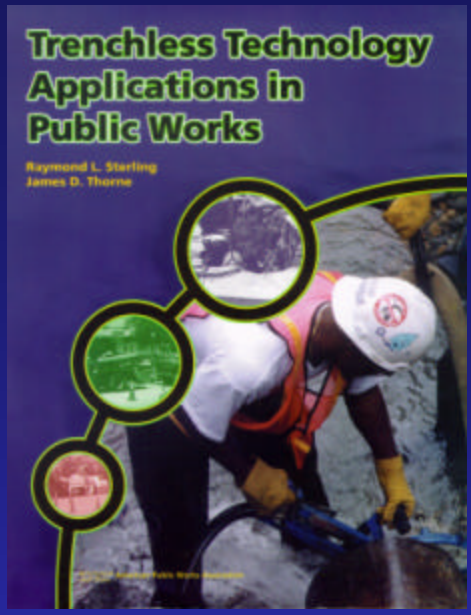


Products:

- Guidance on piping triggers
  - Coordinated with Risk and Innovative Flood –damage Reduction Programs
  - Work individually with Districts leading to multi-program tools

Products:

- Guidance for utilities under levees
  - APWA document
  - Distribution via Trenchless Technology Center, Louisiana Tech
  - With St. Louis District developing specific Corps guidance for permitting

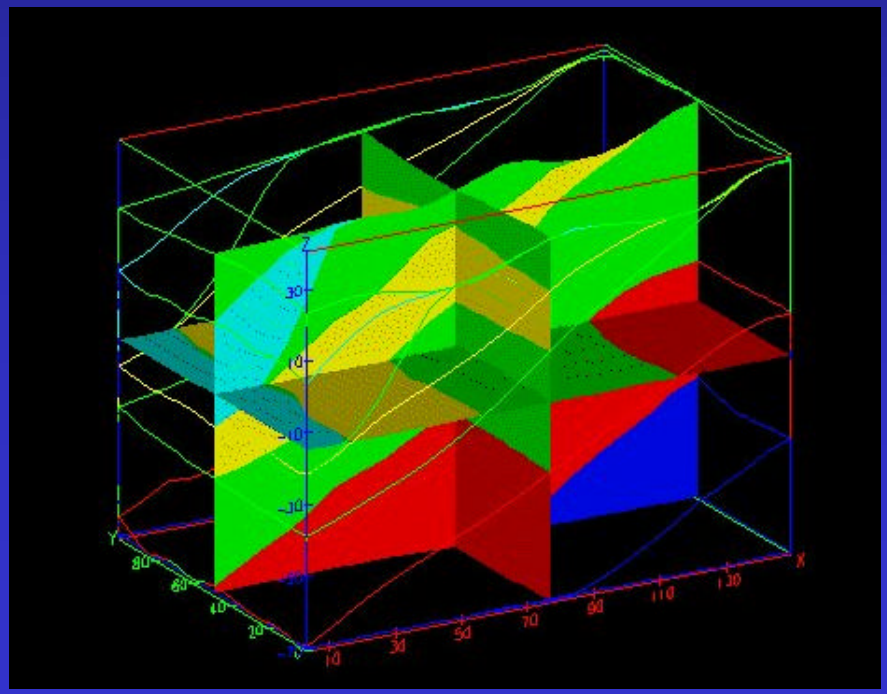


Out-years plans:

- Minimum –impact urban geotechnologies
- Performance of earth embankments and armor stone in cold regions
- How much geotechnical data is enough?
- Landslides and rockfalls into rivers and reservoirs

Out-years plans:

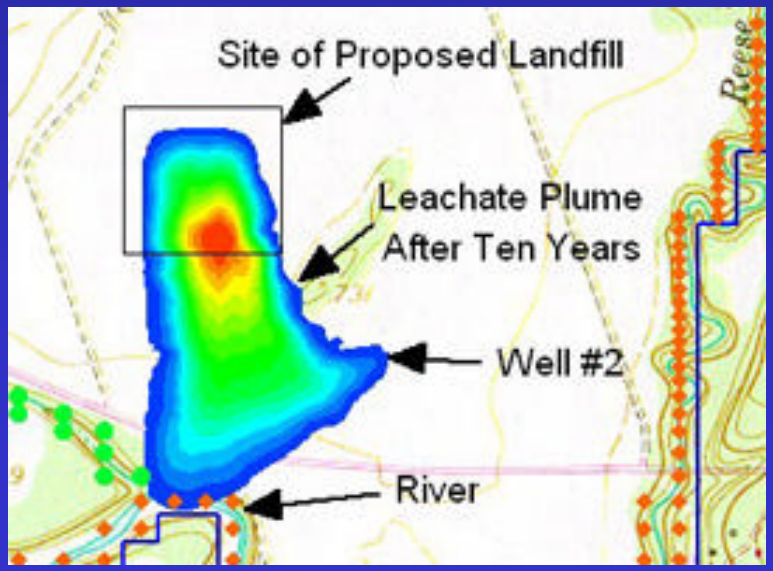
- Geomorphic controls on sediment loads
- Dredge disposal areas: environmental, sediment management, geotechnical controls
- Subsurface geotechnical conceptualization



Out-years plans:

- Abandoned mine lands
  - Easy sites already fixed
  - Only 5 to 15% are water quality problem

- Groundwater modeling
  - Relate surface water to groundwater and improve geotech conceptualization



Research needs:

- Geotechnical engineering/engineering geosciences not seen as Corps mission
- Risk of being ignored in other programs
- Not addressed by other Federal agencies
  - Engineering implications
  - Mitigation and management tools, not just because it's interesting

Research needs:

- Subsurface uncertainty
  - Behavior of earth unknown in predicting behavior of structures and managing infrastructure
- Support to SFO mission with mine lands in Districts
- USSD (USCOLD), APWA, EPA, DOE, others look to Corps for leadership in geotech areas